

Page 22, line 9, change "thermal electric", to
--thermoelectric--;

line 15, change "thermal electric", to
--thermoelectric--;

line 16, change "thermal electric", to
--thermoelectric--;

line 22, after "sensor", insert --is--.

Page 23, line 6, change "thermal electric" to
--thermoelectric--.

IN THE CLAIMS:

Cancel claims 2 and 34-39.

Sub C1 1. (Amended) An apparatus for performing the polymerase chain reaction in a plurality of liquid reaction mixtures[;], said apparatus including a plurality of vials containing such liquid reaction mixtures, said vials having an upper portion and a lower portion[;], said apparatus comprising:

A an assembly for cycling said vials through a series of temperature excursions;

a cover for applying a seating force [directly] to said vials and for applying a constant temperature to the upper portion of said vials; and

a computing apparatus for controlling said temperature excursions of said assembly and said constant temperature of said cover;

said assembly including:

a sample block for receiving said vials;

a plurality of thermoelectric devices controlled by said computing apparatus;

a heat sink;

a clamping mechanism positioned so as to clamp said thermoelectric devices between said sample block and heatsink;

a heater positioned around the perimeter of said sample block; and

a pin having a first end and a second end, said first end in close contact with said sample block and said second end in close contact with said heatsink so as to provide a thermal path between said sample block and said heatsink.

8. (Amended) The apparatus of claim 1 [2] wherein said sample block comprises:

a plurality of sample wells, for receiving sample vials, each well having a top and bottom;

an upper support plate connecting the tops of said sample wells; and

a bottom plate connecting the bottoms of said sample wells.

9. (Amended) The apparatus of claim 1 [2] wherein said [plurality of Peltier] thermoelectric devices are matched to provide a temperature within 0.2 C for a given input current.

Claim 9, line 1, change "2", to -- 1 --

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Claim 9, line 2, delete "Peltier".

Sub C
A4
13. (Amended) The apparatus of claim 9 wherein electrical resistance [the resistivity] of the devices is determined from the equation:

$$R=nr(h/A)$$

wherein [Wherein] R is the electrical resistance [resistivity] of the device, n is a number [of] equal to how many pellets are in the device, r is [the] resistivity of the bismuth telluride being used in the pellets, h is [the] height of the [pellet] pellets and A is [the] cross sectional area of the [bismuth telluride] pellets.

Claim 14, line 1, change "2", To -- 1 --.

Claim 15, line 1, change "2", To -- 1 --.

Claim 22, line 1, change "2", To -- 1 --.

Claim 24, line 1, change "2", To -- 1 --.

Claim 25, line 12, after "vials", insert -- ; --.

AS Sub C
26. (Amended) The apparatus of claim 1 wherein said assembly comprises [of] at least one device [devise] for changing the temperature of said apparatus, further comprising a system for measuring the AC resistance of said thermoelectric [thermal electric] device.

Claim 27, in each of lines 7, 8, 10, 15 and 22 change "thermal electric", to --thermoelectric --.

28 (Amended) A method for measuring the AC resistance of a thermoelectric [thermal electric] device having a first heating and cooling surface and a second heating and cooling surface, said method comprising:

measuring the temperature of said first heating and cooling surface;

measuring the temperature of said second heating and cooling surface;

applying power to said thermoelectric [Peltier thermal electrical] device to cause said first heating and cooling surface and said second heating and cooling surface to attain the same temperature;

applying an AC voltage across said thermoelectric [thermal electric] device;

measuring said AC voltage across said thermoelectric [thermal electric] device;

measuring AC current through said thermoelectric [thermal electric] device;

calculating the AC resistance of said thermoelectric [thermal electric] device from said measured AC voltage and said measured AC current.

30. (Amended) A method for achieving linear temperature transitions utilizing a thermoelectric [thermal electric] device having a Seebeck coefficient, at least a first heating and cooling surface and a second heating and cooling surface

and being operated in a manner causing said first surface to be higher in temperature and said second surface to be lower in temperature relative to each other; said method comprising [the following steps]:

determining a desired heat flow from said lower temperature surface;

determining electrical resistance of said [thermal electric] thermoelectric device as a function of temperature;

determining the Seebeck coefficient of said [thermal electric] thermoelectric device as a function of temperature;

HA
determining conductance [the conduction] of said thermoelectric [thermal electric] device as a function of temperature;

cl
measuring [the] temperature of said lower temperature surface;

measuring [the] temperature of said higher temperature surface;

calculating [the] an average temperature of said lower temperature surface and said higher temperature surface; and

calculating a [the] current required to achieve said desired heat flow as a function of said electrical resistance of said thermoelectric [thermal electric] device as a function of temperature, said Seebeck coefficient of said thermoelectric [thermal electric] device as a function of temperature, said conductance of said thermoelectric [thermal electric] device as a function of temperature, said

temperature of said lower temperature surface, said temperature of said higher temperature surface, and said average of said lower temperature surface and said higher temperature surface.

31. A method for determining the temperature of a mixture in a sample vial, said vial having an upper portion and a lower portion [an] and being contained in an apparatus [comprising] including:

A2
an [as] assembly for cycling said vials through a series of temperature excursions, said assembly further comprising a sample block for receiving said vials;

a cover for applying a seating force on said vials and for applying a constant temperature to the upper portion of said vials; and

C1
a computing apparatus for controlling said temperature excursions of said assembly and said constant temperature of said cover[.];

said method comprising:

measuring [the] temperature of said sample block;

measuring [the] temperature applied by said cover;

determining [the] thermal resistance of said vial between said sample block and said mixture;

determining [the] thermal resistance for air in parallel with said vial between said mixture and said cover;

determining [the] thermal capacitance of said mixture;

determining [the] thermal capacitance of said vial
between said mixture and said cover; and

calculating [the] temperature of said mixture as a
function of said temperature of said sample block, said
temperature applied by said cover, said thermal resistance of
said vial between said sample block and said mixture, said
thermal resistance of air in parallel with said vial between
said mixture and said cover, said thermal capacitance of said
mixture and said thermal capacitance of said vial between said
mixture and said cover.

Claim 32, line 4, delete "Peltier"

line 13, after device, insert

-- located on said assembly --

Claim 40, line 1, change "Peltier thermal electric" to

-- thermoelectric --

line 9, change "thermal electric" to

--thermoelectric--

line 11, change "thermal electric" to

--thermoelectric--

line 16, change "thermal electric" to

--thermoelectric--

line 23, change "thermal electric" to

--thermoelectric--

Please add new claims 41 and 42 as follows:

41. An apparatus for performing the polymerase chain reaction in a plurality of liquid reaction mixtures, said apparatus including a plurality of vials containing such liquid reaction mixtures, said vials having an upper portion and a lower portion, said apparatus comprising:

an assembly for cycling said vials through a series of temperature excursions;

7/8 a cover for applying a seating force to said vials and for applying a constant temperature to the upper portion of said vials; and

a computing apparatus for controlling said temperature excursions of said assembly and said constant temperature of said cover;

wherein said cover comprises:

a platen, vertically and horizontally displaceable in relationship to said vials, said platen including:

an array of openings corresponding to locations of said vials, said openings having a perimeter corresponding to a perimeter of said vials;

a skirt extending downward around the perimeter of said platen, said skirt having dimensions corresponding to the perimeter of a standard microtiter tray, said skirt constructed to engage said perimeter of said tray during vertical displacement of said platen, causing said openings in

said platen to engage said perimeter of said vials, applying a seating force on said vials for maintaining a snug fit between walls of said sample vials and said assembly for receiving said sample vials;

means for forcibly lowering said platen to maintain said seating force; and

heating means positioned in close contact with said platen to maintain said platen at a constant temperature.

48. 42. An apparatus for performing the polymerase chain reaction in a plurality of liquid reaction mixtures, said apparatus including a plurality of vials containing such liquid reaction mixtures, said vials having an upper portion and a lower portion, said apparatus comprising:

an assembly for cycling said vials through a series of temperature excursions;

a cover for applying a seating force to said vials and for applying a constant temperature to the upper portion of said vials; and

a computing apparatus for controlling said temperature excursions of said assembly and said constant temperature of said cover;

said assembly comprising at least one thermoelectric device for changing the temperature of said assembly, wherein said at least one thermoelectric device has a first heating and cooling surface and a second heating and cooling surface;

said apparatus further comprising a system for measuring AC resistance of said thermoelectric device, said system comprising:

a first temperature sensor positioned so as to be in thermal communication with said first heating and cooling surface;

a second temperature sensor positioned so as to be in thermal communication with said second heating and cooling surface;

A8 a bi-polar amplifier circuit for providing power to said thermoelectric device;

a circuit for sensing AC voltage across said thermoelectric device and producing a DC voltage representing said AC voltage;

a circuit for sensing AC current through said thermoelectric device and producing a DC voltage representing said AC current;

a microcontroller programmed to receive said signals from said first and second temperature sensors;

said microcontroller further programmed to cause said bi-polar amplifier to provide power to said thermoelectric device so that said first and second temperature sensor signals indicate equal temperatures;

said microcontroller further programmed to cause an AC voltage to be superimposed on said bi-polar amplifier power;